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cont. plate consists of a light-transmissive material, and said second electrode is transparent and has an equal measure to said first electrode.

a voltage applying unit for applying a voltage between said first electrode and said second electrode; and

Q2 an optical detector for detecting an electrochemiluminescence (ECL) generated from an ECL label resulting from the application of said voltage, to detect target polynucleotides which are trapped by hybridization between said DNA probes fixed to said areas and said target polynucleotides,

wherein at least one species of base labeled with said ECL label is used in an extending reaction to extend said hybridized DNA probes, or said ECL label labels said target polynucleotides, or said ECL label labels an oligonucleotide coupled to said target polynucleotides.

31. (New) A polynucleotide assay apparatus according to claim 30, wherein at least the one species of base labeled with said ECL label is used in said extending reaction and said each of DNA probes has phosphorothioate bonds.

32. (New) A polynucleotide assay apparatus according to claim 30, wherein said optical detector is a pickup device for detecting said ECL from a plurality of said areas as a 2D image.

Ca 33. (New) A polynucleotide assay apparatus comprising:  
a polynucleotide detecting cell provided with a first plate whereon a first electrode is formed and a second plate whereon a plurality of second electrodes are formed each in strip shape in parallel, wherein the surface of said first electrode is divided into plurality of areas, to each of which DNA probes having a different base sequence are fixed, said second electrodes are arranged opposite to said first electrode with a predetermined distance, said second plate consists of a light-transmissive material, and said second electrode is transparent;

a voltage applying unit for applying a voltage between said first electrode and said second electrodes; and

an optical detector for detecting an electrochemiluminescence (ECL) generated from an ECL label resulting from the application of said voltage, to detect target polynucleotides which are trapped by hybridization

between said DNA probes fixed to said areas and said target polynucleotides,

wherein at least one species of base labeled with said ECL label is used in an extending reaction to extend said hybridized DNA probes, or said ECL label labels said target polynucleotides, or said ECL label labels an oligonucleotide coupled to said target polynucleotides.

34. (New) A polynucleotide assay apparatus according to claim 33, wherein at least the one species of base labeled with said ECL label is used in said extending reaction and said each of DNA probes has phosphorothioate bonds.

35. (New) A polynucleotide assay apparatus according to claim 33, wherein said optical detector is a pickup device for detecting said ECL from a plurality of said areas as a 2D image.

Sub 36. (New) A polynucleotide assay apparatus comprising:  
a polynucleotide detecting cell provided with a base plate whereon a first comb-shaped electrode and a second comb-shaped electrode are formed, wherein the surface of said first comb-shaped electrode is divided into plurality of areas each

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2. ~~cont.~~ having equal measure, DNA probes having a different base sequence are fixed to each of said areas, teeth of said first comb-shaped electrode and teeth of said second comb-shaped electrode are arranged in alternate repetition in parallel at equal intervals in one direction;

a voltage applying unit for applying a voltage between said first comb-shaped electrode and said second comb-shaped electrode; and

~~Q2~~ an optical detector for detecting an electrochemiluminescence (ECL) generated from an ECL label resulting from the application of said voltage, to detect target polynucleotides which are trapped by hybridization between said DNA probes fixed to said areas and said target polynucleotides,

wherein at least one species of base labeled with said ECL label is used in an extending reaction to extend said hybridized DNA probes, or said ECL label labels said target polynucleotides, or said ECL label labels an oligonucleotide coupled to said target polynucleotides.

37. (New) A polynucleotide assay apparatus according to claim 36, wherein at least the one species of base labeled

with said ECL label is used in said extending reaction and said each of DNA probes has phosphorothioate bonds.

38. (New) A polynucleotide assay apparatus according to claim 36, wherein said optical detector is a pickup device for detecting said ECL from a plurality of said areas as a 2D image.

G 39. (New) A polynucleotide assay apparatus comprising: a polynucleotide detecting cell provided with a base plate whereon a first comb-shaped electrode and a plurality of second electrodes are formed, wherein the surface of said first comb-shaped electrode is divided into plurality of areas each having equal measure, DNA probes having a different base sequence are fixed to each of said areas, each of said second electrodes is separated from said first comb-shaped electrode and is arranged between two teeth of said first comb-shaped electrode, and said first comb-shaped electrode and said second electrodes are arranged in alternate repetition in parallel at equal intervals in one direction;

electrode selectors for selecting an electrode out of said second electrodes;

D3  
a voltage applying unit for applying a voltage between  
said first comb-shaped electrode and said selected second  
electrode;

C2  
an optical detector for detecting an  
electrochemiluminescence (ECL) generated from an ECL label  
resulting from the application of said voltage, to detect  
target polynucleotides which are trapped by hybridization  
between said DNA probes fixed to said areas and said target  
polynucleotides, and

a device for controlling the duration of the application  
of said voltage on the basis of the velocity of the expansion  
of a region in which said ECL occurs and the distance between  
the center line of each of said teeth of said first comb-  
shaped electrode arranged in alternate repetition in said one  
direction and the center line of each of said second  
electrodes in said one direction,

wherein at least one species of base labeled with said  
ECL label is used in an extending reaction to extend said  
hybridized DNA probes, or said ECL label labels said target  
polynucleotides, or said ECL label labels as oligonucleotide  
coupled to said target polynucleotides.

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40. (New) A polynucleotide assay apparatus according to claim 39, wherein at least the one species of base labeled with said ECL label is used in said extending reaction and said each of DNA probes has phosphorothioate bonds.

41. (New) A polynucleotide assay apparatus according to claim 39, wherein said optical detector is a pickup device for detecting said ECL from a plurality of said areas as a 2D image.

C2  
42. (New) A polynucleotide assay apparatus comprising:  
a polynucleotide detecting cell provided with a base plate whereon a first electrode and a plurality of second electrodes are formed, wherein the surface of said first electrode is divided into a plurality of areas each having equal measure, to each of which DNA probes having a different base sequence are fixed, each of said second electrodes is separated from and surrounded by said first electrode, and arranged in a central part of each of said areas, and arranged at equal intervals in two directions;

electrode selectors for selecting an electrode out of said second electrodes,

a voltage applying unit for applying a voltage between said first electrode and said selected second electrode;

an optical detector for detecting an electrochemiluminescence (ECL) generated from an ECL label resulting from the application of said voltage, to detect target polynucleotides which are trapped by hybridization between said DNA probes fixed to said areas and said target polynucleotides, and

a device for controlling the duration of the application of said voltage on the basis of the distance between the central part of said selected second electrode and the boundary of said selected area and the velocity of the expansion of the region in which said ECL occurs,

wherein at least one species of base labeled with said ECL label is used in an extending reaction to extend said hybridized DNA probes, or said ECL label labels said target polynucleotides, or said ECL label labels an oligonucleotide coupled to said target polynucleotides.

43. (New) A polynucleotide assay apparatus according to claim 42, wherein at least the one species of base labeled with said ECL label is used in said extending reaction and said each of DNA probes has phosphorothioate bonds.



44. (New) A polynucleotide assay apparatus according to claim 42, wherein said optical detector is a pickup device for detecting said ECL from a plurality of said areas as a 2D image.

Sub  
Seq  
G 45. (New) A polynucleotide assay apparatus comprising:  
a polynucleotide detecting cell provided with a first plate whereon a first electrode is formed and a second plate whereon a second electrode is formed, wherein the surface of said first electrode is divided into plurality of areas, to each of which DNA probes having a different base sequence are fixed, said second electrode is arranged opposite to said first electrode with a predetermined distance, said second plate consists of a light-transmissive material, and said second electrode is transparent and has an equal measure to said first electrode;

a power source which applies a voltage between said first electrode and said second electrode;

a power source controller which controls the duration application of said voltage;

a TV camera having a plurality of pickup elements which detects, as a 2D image, an electrochemiluminescence (ECL)

generated from an ECL label labeling a base which extends DNA probes hybridized with target polynucleotides by an extending reaction at said areas resulting from the application of said voltage, to detect the presence or absence of any extended chain generated by said extending reaction, for detecting said target polynucleotides which are trapped by hybridization between said DNA probes fixed to said areas and said target polynucleotides; and

an optical system which connects optically said polynucleotide detecting cell and said pickup elements.

C2 46. (New) A polynucleotide assay apparatus according to claim 45, wherein at least one species of base labeled with said ECL label is used in said extending reaction and said each of DNA probes has phosphorothioate bonds.

47. (New) A polynucleotide assay apparatus comprising:  
a polynucleotide detecting cell provided with a base plate whereon a first electrode and a plurality of second electrodes are formed, wherein the surface of said first electrode is divided into plurality of areas each having equal measure, to each of which DNA probes having a different base sequence are fixed, each of said second electrodes is

separated from and surrounded by said first electrode, and arranged in a central part of each of said areas, and arranged at equal intervals in two directions;

a power source which applies a voltage between said first electrode and said second electrode;

C2 a CCD camera which detects, as a 2D image an electrochemiluminescence (ECL) generated from an ECL label labeling a base which extends DNA probes hybridized with target polynucleotides by an extending reaction at said areas resulting from the application of said voltage, to detect the presence or absence of any extended chain generated by said extending reaction, for detecting said target polynucleotides which are trapped by hybridization between said DNA probes fixed to said areas and said target polynucleotides; and

a controller which controls application of said voltage by said power source and reading of signals accumulated in said CCD camera.

48. (New) A polynucleotide assay apparatus according to claim 47, wherein at least one species of base labeled with said ECL label is used in said extending reaction and said each of DNA probes has phosphorothioate bonds.